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The Need For Skilled Workers in Massachusetts

By George S. Kariotis, Secretary
Massachusetts Executive Office
of Economic Affairs

The greatest single need of our growth companies in Massachusetts—even above the need for genuine tax reform—is the need for skilled people. If we don't provide trained people, these companies will go to the Sun Belt and other places where they can get skilled workers. Make no mistake about it—our competition around the country is eating our lunch. They are working hard at it. Other states are upping their financial antes to support skills training. They hope to be able to say to our industries—"Come on down here and locate; we will provide you with just the trained help you need." California is already operating a state-supported $25 million program of training to meet the critical shortage of skilled workers. North Carolina recently appropriated $24 million to build a microelectronics facility to woo new business into that state.

We have a need to train workers. But we have another problem: where are we going to get the people? The teenage population will drop. So we must train the elderly, racial and linguistic minorities, women (only 5% of the engineers in this country are women), the handicapped, etc. We have built ourselves a permanent welfare population and we must get rid of that burden.

This is some of the thinking that led to legislative approval this year of Governor Edward J. King's proposal for a Bay State Skills Corporation (BSSC). The new Skills Corporation has been established and funded by the Legislature ($3 million over two years with another $3 million to come from private sector contributions). The BSSC will have as its goals the training of as many of our unemployed and underemployed people as possible for work in the private sector.

We've had some experience with this now and we know where we want to go. The BSSC's predecessor was the interim Bay State Skills *Commission*, funded by a half million dollars of the Governor's funds last year. At that time, we put in place a number of training programs at community colleges and other training institutions in skills areas that we identified, where shortages existed. These projects included courses in high technology, machine trades, and health. They trained the unemployed and the underemployed to be, for example, electronic technicians, machinists, tool and die makers, computer programmers, welders, and registered nurses. The state committed $500,000 through the BSSC, while the private sector more than matched that amount, contributing $800,000.

A required ingredient in these projects was the participation of private companies. For example, one of the nine programs in the high technology and computer field included a partnership between Boston YWCA's Natick branch and Digital Equipment Corporation. In all, 13 women were trained in this program for positions as electronic technicians in the computer field. Upon completion of the course, over 75% of the trainees were placed in jobs with private high technology firms. According to the director of this program, Clara Nicholson, the key to its success was the complete involvement of Digital in the training, the motivation of the trainees, and the career planning and supportive services of the trainees.

Another example: Data Printer Corporation in Malden and Bunker Hill Community College in Charlestown collaborated in an upgrading program for current Data Printer employees. The skills upgrading program provided training to assemblers, technicians, first-line supervisors, and quality control personnel. In all, 99 Data Printer employees were involved in the training over a six month period. Data Printer officials said that the program dramatically reduced the cost of training, improved the qualifications of its work force and provided a structure for formalized career pathing for Data Printer's enthusiastic employees.

The interim Commission's projects acted as a catalyst for public/private skills training and education ventures in the computer/high technology field. One final, excellent example was the cooperative program of Worcester Polytechnic Institute (WPI) and Computervision Corpora-

tion of Bedford. This combined approach was directed towards an advanced, state-of-the-art engineering and computer science program. Computervision donated computer aided design/computer aided manufacturing (CAD/CAM) equipment and software valued at $350,000. The program prepared WPI undergraduate and graduate students and practicing professionals for occupations at the cutting edge of the high technology firm. This was another effective alliance of industry, government, and education.

As part of the activities of the interim Bay State Skills Commission, these projects provided valuable experience for BSSC managers and the Executive Office of Economic Affairs in the creation and management of effective skills training programs.

In the new $3 million BSSC, which is presently being organized, we have a number of principal thrusts. First, we want to help retrain our industrial base in order to keep our companies here. If we don't do that, they will go wherever they have to go to get those people. We need our companies here because we need the revenue base for the things we want to do in Massachusetts. It's an economic problem, essentially. Above all, what we're trying to do makes economic sense—train people to work at permanent jobs in the private sector so that the companies will stay in Massachusetts. Secondly, we will, down the road, derive a steady stream of income, which the State needs to finance its social and other programs.

So, now that we have the BSSC—which should be organized and operating by early 1982—how will all this work? Essentially, we will first identify areas with substantial shortages of skilled people. Then we will put out requests for proposals and vocations to both public and private training institutions, saying that we are interested in obtaining proposals from them in these areas. Working with them, we can put together innovative skills training programs in specific target areas. We will then consider funding certain programs, using state dollars to be matched at least on a dollar basis by industry. (This matching principle worked well in the interim Bay State Skills Commission where the state put up $500,000 and industry $800,000.)

The same thing will be true in the new BSSC. This matching fund concept has to be in place. We won't entertain the proposal from the training institution until it has first gone off and found itself a partner in industry to help fund at least half the cost of the program.

One thing to bear in mind is that the BSSC is not going to train all the workers needed. At most, we will be training 2,000-2,500. There are many other training organizations out there, including a number in industry. Industry does a lot of its own training. We want to supplement that: we don't want to replace it, and we don't want to replace programs that are already going. We want innovative programs to enlarge the training capabilities throughout the state. That's why we're making that an ingredient in the request for proposals. We're not going to just go out and pay a school for what it is doing already.

Another impression that may need correcting—the BSSC is not an exclusively high technology project. The high technology industry is in essence an electronics industry. But there are a lot of other growth industries that are called high technology, but are not necessarily electronics. And there are many other growth industries that are neither electronics nor high technology in general. The biomedical industry, for example, is coming along very nicely in Massachusetts. Indeed, in our growth industries we have tallied 50 high demand occupations that the new BSSC will be looking at closely. Among these, of course, are the electrical engineers, computer programmers, and computer systems analysts. But there are dozens of others such as machinists, lathe machine operators, industrial engineers, clinical lab technicians, practical and registered nurses, opticians and lens grinders, radiologic technicians, tool and die makers, health administrators, dental hygienists, etc.

So there are a lot of different areas that we can attack with this program. As we develop our skills training activities, what are the projections for jobs opening up in Massachusetts in the years ahead? Taking just the high technology industry itself, for two years in a row the Massachusetts High Technology Council has been conducting intensive surveys of its own membership of more than 100 companies. Its projection is that in the so-called high technology electronics industry over the next three years, there will be something between 50-100,000 new jobs created. But that includes all the jobs from the top ones, which are senior engineering positions, down to the assembly jobs and all the ancillary jobs that go with it—encompassing technicians, quality control, shipping and receiving, and so forth. So it's a very optimistic forecast just for that growth industry by itself.

In the other growth industries, there are some interesting figures, too. A study has been done of the 50 high demand occupations already mentioned, covering the categories of engineers, health workers, other technical workers, other professional managers and proprietors, clerical occupations, craft workers, operatives, and service workers. The study was undertaken by the Executive Office of Economic Affairs, the Occupational Information Coordinating Committee, the Department of Manpower Development, and the Division of Employment Security. The study found that, in the non-high technology categories of growth industries in Massachusetts (42 categories altogether), projected annual job openings are 41,560. So, we have a good idea of the numbers of new jobs that will be opening up in our growth industries, including high technology. And, thanks to the Massachusetts Legislature, which had to approve the BSSC and its $3 million funding, we have the mechanism in the place to do some valuable skills training to help fill those jobs.

What kinds of people are there out there who will be looking for these kinds of jobs and taking advantage of these training programs? We will be directing our efforts toward a very diverse number of people in the population.

First, we have, for example, the current problem of municipal workers being laid off. Many of them have no skills other than the one they have been employing in their particular job. For them, some retraining will be useful. Secondly, we've got a large number of teachers who probably have never looked for work before and might not even know how to make out a resumé. They

have been teachers, and very good ones. Many of them, especially the ones who specialize in science, should be readily trainable—retrainable into something else to be used in the electronics industry such as computer programmers.

We've also got a huge population out there, sort of a steady base population that has probably never worked—or it's been so long since they have worked that they've forgotten how. Let's say that those who have been supported by working people, the welfare population of the city, contains a large number of people who really would like to work and get decent jobs, but they have no skills. They need to be given some skills so that they can go to work. It makes economic sense to do that because, for every person taken off a support like welfare and put to work in the private sector, you're probably causing at least a $5,000 positive swing in the state economy. So, if you take 20,000 people—that's $100 million—and if you make social/economic changes like that, you can make it happen.

Take another category—teenagers. Since we are projecting a growing shortage of teenagers in this country for the next 5-10 years, we're going to have an actual shortage of minds and bodies to train. In addition to all of the above, we are going to want to attract women into high technology. They have stayed out of the sciences pretty much and have done a lot of assembly work. We've got to entice them at an early age in school to study math and sciences to become engineers. Other countries are doing it and we're not doing it very well here.

The elderly—we are going to have to persuade the elderly—the fastest-growing segment of our population—to come in and share jobs so that maybe three older people will fill one job. That will satisfy their needs for a little supplemental income and it will satisfy our needs because we have someone to do the job. The handicapped are really great employees once they are trained because they are very dedicated, very grateful for good work. So we're going to have to go after them. We can't afford to overlook any segment of our population in the future in the attempt to try to staff our companies with workers.

Competition with other states is intense. We want to hang on to what we have and are going to make this training program work. However, we can train only a small part of the tens of thousands of people who would like to receive training. Hopefully, if we can show exceptional, maybe even superlative, results with what we have to work with, the Legislature will be encouraged to enlarge the program. And hopefully, industry will go right along with it because we will keep industry-matching a necessary ingredient at all times.

Index of High Demand Occupations by Major Occupational Clusters

I. *Professional and Technical*
- A. *Engineers*
  1. Electrical Engineers
  2. Industrial Engineers
  3. Mechanical Engineers
  4. Drafters
- B. *Health*
  5. Registered Nurses
  6. Clinical Lab Technicians
  7. Dental Hygienists
  8. Radiological Technologists
  9. Therapists
- C. *Other Technical*
  10. Electronic Technicians
  11. Computer Programmers
  12. Computer Systems Analysts
  13. Computer Service Technologists
- D. *Other Professionals, Managers and Proprietors*
  14. Personnel and Labor Relations
  15. Bank, Financial Managers
  16. Buyers, Wholesale and Retail
  17. Purchasing Agents
  18. Health Administrators
  19. Managers, Superintendents of Buildings
  20. Real Estate Agents, Brokers

II. *Clerical Occupations*
- 21. Legal Secretaries
- 22. Medical Secretaries
- 23. Other Secretaries
- 24. Bookkeepers
- 25. Expeditors, Production Controllers
- 26. Insurance Adjusters, Examiners
- 27. Receptionists
- 28. Shipping and Receiving Clerks

III. *Craft Workers*
- 29. Carpenters and Apprentices
- 30. Electricians and Apprentices
- 31. Painters and Apprentices
- 32. Plumbers and Pipefitters
- 33. Excavating and Grading Machine Operators
- 34. Heavy Equipment Mechanics
- 35. Air Conditioning, Heating and Refrigeration Mechanics
- 36. Machinists
- 37. Tool and Die Makers
- 38. Radio and Television Repairers
- 39. Opticians and Lens Grinders

IV. *Operatives*
- 40. Assemblers
- 41. Photographic Process Repairers
- 42. Fork Lift Operatives
- 43. Truck Drivers
- 44. Lathe Machine Operatives

V. *Service Workers*
- 45. Cooks
- 46. Waitresses and Waiters
- 47. Dental Assistants
- 48. Health Aides
- 49. Practical Nurses
- 50. Child Care Workers

Source: *High Demand Occupations in Massachusetts 1981*, Commonwealth of Massachusetts Executive Office of Economic Affairs, Occupational Information Coordinating Committee, Department of Manpower Development, Division of Employment Security.

Small Business in the 1980s: Holding on to Hard-Earned Economic Gains

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It was about five years ago that business leaders, government officials, and certain elements of the academic community began to suggest that small business was being neglected as a driving force in the U.S. economy. They noted that small firms bore a disproportionate burden of regulation and taxation, and that the prospect for national economic growth was closely linked to the ability of small firms to proliferate.

Actually, there were a number of small business advocates who had been making these claims for many years. It wasn't until David Birch at MIT provided data which supported those claims that details of the small business sector's problems and its importance to the economy became widely accepted.

Much of the thinking about small-sized firms in 1977 focused on three specific problem areas: capital formation, government regulation and taxation, and the growing concentration of capital and profitability within a relatively small number of firms. I'd like to examine those three areas as they exist today and comment upon our success or failure in dealing with them. Additionally, I'd like to deal with another critical issue for the survival of entrepreneurship—the growing awareness by small business of its political force.

Capital Formation

Small firms get their seed and growth money in a number of ways, none of them simple. Personal savings, conventional bank financing, or the advantageous or gullible friend or relative are the most common sources of funds for new businesses. Companies that have survived the first years can tap into the more institutional financial markets with public or private equity offerings or more liberal bank borrowings. In 1977, a combination of inflation and federal tax policies, which had customarily discouraged investment in less stable companies, had closed off even the above mentioned avenues of financing a small business. Changes made in the federal tax law during 1978 and 1981 should provide investors with opportunities to shelter income by investing in new or growing companies, either directly or through financial intermediaries. Specifically, the reduction in the individual tax liabilities of high income persons should enlarge the nation's investment pool considerably. Some of this will trickle down to small business. Lower capital gains taxes, investment tax credits for research and development expenditures, and the new accelerated cost recovery system (ACRS) will all create more capital internally and externally for all businesses. The way in which small innovative companies finance themselves will change dramatically. Leasing of equipment will become a much more common method of financing. The corner grocery store and less glamorous manufacturers will probably not benefit greatly from the tax laws and will have to generate capital using the "beg, borrow, and talk-fast" method that they have always relied upon.

Regulation

In 1977, government regulators were generally perceived by the business community to be out of control. At that time 90 federal agencies issued 7,000 new rules each year. Logic alone, with an assist from marginal cost theory, tells us that compliance with regulation is much more costly as a percentage of sales for smaller firms than for larger companies.

If keeping informed about and complying with regulations is costly, entering into litigation can be financially devastating for a small firm. The Regulatory Flexibility Act of 1980 has placed some of the risk of entering litigation on the regulator. A business that is successful in overturning a regulatory judgment in court is now reimbursed for court and legal costs.

Most regulatory agencies have become aware that regulations can be disproportionately burdensome to small producers. Accordingly, many agencies have built benefit/cost analysis by size of firm into their economic impact studies.

An optimist would conclude that the days of regulation for the sake of regulation are over. Presumably, the regulators will be forced to consider the long-term impacts of their actions and business will realize that they do not have the right to impose economic, health, and environmental hazards on their workers or on society in general.

Economic Concentration

The concentration of economic power within a few firms in an industry has been the subject of debate and litigation for a century. Previously, the dangers of concentration were perceived in terms of anti-competitive practices. Recently, we have come to realize that there is additional danger involved as those few firms grow complacent with their market position, get conservative in their product development strategies and become easy targets for leaner, more innovative, more modern (and sometimes subsidized) foreign competitors.

Moreover, federal laws designed to promote competition by eliminating monopolistic practices have been undermined by time-consuming administrative procedures and protracted court battles. This trend may have culminated in the eight year-long ITT case, a bonanza for cadres of lawyers.

Recent administrations have failed to adequately remedy the dangers of excessively concentrated economic power and resources. For example, under the Reagan Administration, the FTC has failed to check the spread of mergers and acquisitions (e.g., Dupont's rapid absorption of Conoco).

To create a healthy entrepreneurial atmosphere, government must help check the spread of excessive

economic concentrations. Small businesspersons don't want unfair competitive advantages, they want equitable competitive opportunities.

Self-Awareness

The most significant phenomenon occurring in the small business environment during the last five years has been the development of a "small-business identity." There really is no homogeneous small business sector and there are but a handful of issues, political or economic, which are common to all small firms. Yet, thanks to a rare cooperative effort on the part of a number of organizations representing various business interests, we have observed tremendous awareness of that handful of issues and massive political pressure organized around them.

There is a good deal of pride in being a small businessperson. The press has taken up the chant and even the smallest of the small town daily newspapers run feature articles that lionize the efforts of individual entrepreneurs. In the last two years, at least a dozen new publications have appeared that are targeted specifically to small business owners.

In spite of all the victories gained by small business during the last five years, the typical company with fewer than twenty employees is only treading water. General economic conditions threaten to offset the advances made on the tax front. (Tax breaks are of little value to firms that have no profits to tax.)

The last five years have provided small businesses with a number of forums in which to raise their collective concerns. Both opinion leaders and a base for researching small business problems have emerged. Further progress is dependent upon the continued cooperation of those opinion leaders, the existence of supporting data, and the presentation of a united small business sector.

The October 1981 Massachusetts Economic Policy Analysis (MEPA) Model Forecast

by George Treyz and Roy Williams*

The Massachusetts economy stumbled in the third quarter of 1981. The major sources of the employment drops were decreases in local and state government employment resulting from Proposition 2½ and the state legislature's response to it, and a drop in Massachusetts manufacturing employment both absolutely and relative to the nation. The employment reductions were reflected in an increase in the state unemployment rate of seven-tenths of one percentage point at the same time that the nation's unemployment rate was decreasing by two-tenths of one percentage point.

Is this dip in the state's economy the beginning of a prolonged downturn? We doubt it for two reasons. First, some of the local government employment drop was due to temporary teacher layoffs and will not be permanent. And second, manufacturing employment will pick up again both absolutely and relative to the nation when defense and equipment spending begin to respond to Washington's new spending and tax policies. However, equipment purchases may be held down by high interest rates and the strong dollar abroad.

The outlook for price & wage inflation is for lower wage and price increases in the nation and therefore in Massachusetts than were expected a few months ago. By 1982 the rate of price increase is expected to be below eight percent both in Massachusetts and in the nation.

One of the consequences of having a lower increase in wages and prices in Massachusetts than in our previous forecast is that personal income and the dollar volume of sales both grow more slowly, and, hence, income tax and sales tax collections are reduced. This will put further pressure on the state budget, which sets fixed amounts of spending but whose income depends on the dollar growth of the tax bases.

Since the possibility of a national recession is also being discussed, we have prepared an alternative forecast for Massachusetts based on a recession forecast for the nation. It shows a growing rather than a stable and slightly declining unemployment rate from now into the first quarter of 1982. It also shows substantially lower state revenues in both fiscal 1982 and fiscal 1983.

In summary, we expect the Massachusetts economy to recover from its poor performance in the third quarter of 1981 but not to gain any real momentum.

Real Per Capita Disposable Income

*Director and Associate Director, respectively, of the MEPA project, Economics Department, University of Massachusetts, Amherst, MA 01003 (Tel. 413-545-0915). Technical support was given by staff of the Massachusetts Division of Employment Security. Support from the Legislative Science Resource Office, the Department of Public Welfare, the Executive Office of Economic Affairs, the Division of Employment Security, and Massport. National inputs from CONTROL092381 and RECESSION092481 from Data Resources, Inc.

October Control Forecast

Summary Report
Massachusetts Economic Policy Analysis Model
(Seasonally Adjusted Annual Rates)

	1981	1982	1983	1981:2	1981:3	1981:4	1982:1	1982:2
Employment—Nonag. W. & S.	2668	2715	2790	2676	2643	2670	2689	2710
% Change	.8	1.7	2.8	-1.2	-4.9	4.2	2.9	3.2
Manufacturing	669	685	708	673	664	670	676	681
% Change	-.6	2.3	3.5	2.6	-5.5	3.7	3.4	3.4
Non-Manufacturing	1999	2030	2082	2003	1979	2000	2014	2029
% Change	1.2	1.6	2.5	-2.4	-4.7	4.3	2.7	3.1
Unemployment Rate	6.1	6.1	5.6	5.9	6.6	6.1	6.2	6.0
Employment Rate Index*	105.4	106.8	109.5	105.8	104.3	105.2	105.9	106.6
% Change	-.1	1.3	2.6	-1.9	-5.7	3.7	2.5	2.7
Relative to U.S. Index*	100.0	100.5	101.6	100.5	98.8	99.6	100.1	100.6
Rate of Wage Change	9.1	7.7	7.2	9.2	9.7	6.8	6.9	7.7
Wage Index Rel. to U.S.*	93.9	94.4	94.7	93.8	94.0	94.1	94.2	94.4
Avg. Weekly Hours in Mfg.	40.2	40.4	40.5	40.3	40.1	40.3	40.3	40.4
Rate of Price Inflation	11.3	7.5	7.7	7.1	10.9	5.9	6.9	7.3
Relative to U.S. CPI*	97.0	96.6	96.7	97.1	97.0	96.6	96.6	96.5
Personal Income (mil$)	63459	69464	76021	62865	64050	65523	66962	68555
% Change	10.9	9.5	9.4	9.9	7.8	9.5	9.1	9.9
Disposal Income (mil$)	52911	58251	64329	52339	53285	54796	55919	57138
% Change	10.4	10.1	10.4	9.0	7.4	11.8	8.5	9.0
Real Per Cap. D.I. Index*	105.6	107.9	110.5	105.8	105.0	106.3	106.6	107.0
Relative to U.S.*	104.3	105.2	105.6	104.7	103.8	104.5	104.9	105.2
Rel. Business Cost Index*	95.9	95.8	96.0	96.0	95.7	95.7	95.7	95.7
Manufacturing*	95.0	94.7	94.9	95.1	94.7	94.6	94.6	94.7
Non-Manufacturing*	96.3	96.2	96.5	96.4	96.2	96.1	96.1	96.2

*Indexes equal 100 in calendar 1973.

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Management in the 80s: Challenge and Opportunity

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This article is adapted from a speech delivered by Earl Myerholtz at the School of Business Administration on October 14, 1981.

Management in the 80s will differ from management in the 60s and 70s in several important respects. One is the importance of worldwide competition and of viewing business on a worldwide basis. The best example of an industry that did not do this adequately during the 60s and 70s is the US automobile industry, which today is paying the penalty. Another transformation involves the changing expectations of the American workforce; a third is the explosive growth of technology. These changes have been going on during the 70s without adequate recognition by US management and have thus contributed to the decline of the American economy.

Quite frankly, American management is failing. While an honest confession is good for the soul, it is bad for the reputation. Put another way, the title of this essay could be "American Management: We Can't Do Things the Same Way Anymore" or "American Management Must Change." Management must also help to make change in other sectors of American society as well.

What's implied here is nothing more than a revolution in the way that US management runs its business, and in how business creates its technology, raises its productivity, and competes in international markets on a scale vaster than ever before anticipated. This transformation calls for critical decisions now to invest in new management techniques and technology for production of high-quality products and services at competitive prices. All this is critical to the vitality of American business and its continuing contribution to the US economy and standard of living.

US management must address another essential ingredient of this revolution. This is involvement with all of the constituents of business. It is imperative that management promote a far more cooperative, productive relationship with employees, government, suppliers, communities in which it operates, and the academic community. We must get away from the adversary relationship that has too frequently prevailed during the past twenty years. The degree of adversity has varied — from the most intense between unions and management to polite coexistence between the academic community and business — but more cooperative relationships are necessary with all.

The American business manager must play an active and influential role in all of these areas. He can no longer be isolated and concerned only about this month's level of sales and production.

In particular, he must maintain continuing involvement with government at all levels to help solve our country's most critical problem — the insidious problem of inflation and slow economic growth often referred to as stagflation.

The climate for change is encouraging: recongition of the need for change is widespread. We are beyond the point of believing that having the government throw more money at every problem will bring a solution. Indeed, management must accept responsibility and find solutions to the urgent and overriding need to sharply improve American productivity and quality. This refers not only to the goods and services that we ship out the back door to our customers, but to the quality of work life and of the work environment that will enable the American worker to help meet these productivity goals and become more of a partner with management. This sense of partnership, this sense of community among all the constituents of business, is a fundamental part of the revolution I referred to earlier.

Without trying to offer solutions to all of the world's problems, I would like to focus on two issues. As I see it, significant change revolves around two fundamental axes. One axis represents rapid technological progress, particularly in the field of electronics and information systems, that will influence every phase of management and will offer solutions to previously unsolvable problems.

The other axis represents an understanding of the full potential of the American workforce and of marshalling that potential for the benefit of everyone. This means using employees' full knowledge rather than just their muscle and a narrow spectrum of their potential skills. They have much more knowledge about their jobs and the business that we must utilize more productively.

In short, the first axis involves technical systems while the second involves people systems. We must be innovative and take risks. Some other countries, particularly Japan, have moved ahead of us in both systems and are increasing their penetration into our markets.

Let's talk about technical changes now in progress. Some say we are moving from the industrial age to the information age. Certainly, we are moving into an era of electronics that will endow business with tremendous power and accelerated growth. This era will offer the following capabilities:

- the ability to have information available worldwide instantly through audio visuals and two-way communications
- the ability to control machines and processes precisely and without human intervention
- the ability to build simulated models of plants or operations to test the impact of different management decisions in seconds or minutes rather than in weeks or months
- the ability to forecast, plan and schedule plants to a degree that was a dream in the past

America is behind in applying technology. For example, computer hardware is ten years ahead of computer software and computer software is ten years ahead of users. Twenty years. Is it any wonder that the titles of Peter Drucker's book, *Managing in Turbulent Times*, and the Harvard Business Review's "*Managing the Crisis in Data Processing*" are so appropriate?

A recent study by Kearny indicates that among the nation's *premier* companies only 8% had an integrated business plan and information system. Over five years, that same 8% out-performed the other companies by 300% in return on equity, return on total capital, and net profit margin.

Indeed, putting this technology together into a total business system to support a well-developed business strategy will allow the manager of the 80s to fine-tune a business to a degree heretofore impossible. This will result in higher quality products at lower real costs.

Hand-in-hand with these developments, we must consider people systems. There's no doubt that we have a tremendous reservoir of talent, skills, and ideas within the great American workforce. There's also no doubt that U.S. management has generally failed to tap the great potential of its workforce. Some companies, including my own, have recognized the critical importance of people systems and the need to create internal environments that enable people to derive satisfaction and fun from work — to feel that they are part of the organization; that their ideas and attitudes are valued; and that their contributions can help the organization achieve goals and objectives that otherwise might not be attained. We have worked from the Theory Y principle of Douglas McGregor — that people come to work wanting to do good work and that they gain satisfaction from work while making significant contributions.

Some, although not enough, companies have done some good things. Now we have to do a lot more — not just some companies and their management, but *all* management. This revolution in people systems has emerged under the guise of various labels: employee participation, quality circles, employee empowerment, and quality of worklife, to name a few. Whatever the tag, the underlying concept is the same: people want to influence their organizations. People want their efforts recognized as critical to organizational success. How we cause this to happen is our greatest challenge on the people side of the house.

A significant phase of this revolution involves changing attitudes toward productivity. Productivity is no longer a dirty word. Don Ephlin, a vice president of the United Auto Workers, was invited to speak to a conference of TRW's senior human relations managers earlier this year. His topic: "Union Views toward Productivity." Ephlin's basic theme was that Americans will support productivity efforts so long as they do not work themselves out of a job. But perhaps even more significant was this belief that unions and management need to curb adversary relationships and pull together in improving productivity.

A recent article in *Business Week* referred to America's obsession with the Japanese style of management — the trust and confidence that the Japanese place in workers, the use of quality circles, and the considerable attention that some U.S. companies are giving to the whole arena of employee participation. I could cite many other examples which are bringing employee participation in productivity and quality out of the shadows and into the mainstream of American working society.

Finally, on October 2nd *The Wall Street Journal* ran a lead article on the Japanese Honda plant in Marysville, Ohio. That plant is turning out practically defect-free motorcycles using Japanese management principles and American workers. Not only is their product quality equal to, or better than, the same products produced in Japan, but there's high morale, great pride, very low absenteeism, and low turnover. What I found most interesting was a reference to the attitude of Japanese management not involved in the American Honda plant. This attitude was that American workers were of lower quality than the

Japanese in terms of education, ability, turnover, morale, absenteeism, and productivity. The conclusion was that Honda took a daring risk by building a plant in Ohio.

Any participant in the American business or industrial scene should know that this gloomy view is inaccurate. But what is accurate is that we in the U.S. have not done nearly enough to tap the latent potential of the American worker. That is what we must do more of — much more of — on the people side of our industrial society.

What are the implications of these trends for the academic community? To equip managers for the challenges of the 80s and beyond, universities must provide future business leaders with a varied background. This background must comprise the following priorities:

- First, the basics of business — build a sound base in finance, marketing, strategic planning, economics, etc. The information age requires this foundation more than ever.
- Second, build an awareness of the information age — not only where we are today, but also where we are going. Emphasize the importance of integrating information technology with business strategy.
- Third, promote an awareness of business as an international endeavor.
- Fourth, create a climate where a degree is viewed not as an end, but as a stimulus to further learning. The accelerated rate of technological change demands ongoing learning. (To use an old cliché: "You can't manage today's business with yesterday's technology and have a successful business tomorrow.)
- On the people-oriented side of the spectrum, universities should promote an appreciation and understanding of the factors that motivate employees and the firm's publics. Accordingly, the curriculum should include a program on organization development, behavioral science, and communications. It should offer case history studies of successful programs in employee participation, investigating both Japanese and American models. Finally, it should emphasize the need for more cooperative relationships among all the constituents of the business society.

We can't afford to train engineers, accountants, or business majors whose educational background is restricted to study and proficiency in the techniques and practices of their primary academic emphasis. Technical proficiency is not enough. The real world of work involves people, who are crucial to the accomplishment of business objectives and tasks. Only when an internationally aware management integrates people priorities with current technical and basic business skills will it meet the challenges and opportunities of the 1980s.

Defense Spending and Massachusetts Industry during the 1970s

Louis Wigdor
Editor
MASSACHUSETTS BUSINESS & ECONOMIC REPORT

Judging from the federal government's customary flow of defense dollars to Massachusetts, the Commonwealth should benefit significantly from the Reagan administration's emphasis on defense spending. A recent study by the Massachusetts Division of Employment Security[1] concisely documents the Commonwealth's fortunes as a recipient of defense expenditures from 1969-1979.

An encouraging finding is Massachusetts's stability as a leading defense recipient during the eleven year period: Massachusetts ranked from seventh to fourth among the states in dollars received for federal military prime contracts (MPC). This amounted to 4.5% of the federal government's total MPC expenditures. (See Table 1.) In 1979 Massachusetts firms received $3.7 billion or 5.3% of the nation's MPC expenditures. During the same year MPCs accounted for 5.9% of the Commonwealth's total personal income, compared with the national average of 3.0%.

The Division of Employment Security's study also reveals that most MPCs awarded to Massachusetts firms favor sophisticated state-of-the-art weaponry over production of conventional equipment. Accordingly, in 1978 80% of the MPC awards to Massachusetts firms went toward missile and space systems, aircraft engines, and communications equipment. By contrast, only 4% of the awards went to conventional equipment such as combat vehicles, spare parts and ammunition. Of 1978 MPC dollars to the Commonwealth, 30% went toward research, development, and test and evaluation work.

From 1969 to 1978 defense related employment in Massachusetts increased 23% from 509,250 to 621,440. (Total employment in the Commonwealth during 1978 was 2.66 million.) Defense related firms are defined as those that have prime contracts with the Department of Defense or that provide a good or service which falls into the Department's procurement categories. (See Table 2.) As Table 2 indicates, "electric and nonelectric machinery" decisively led all other categories in defense-related employment during .978. Notice that the ascent of machinery as a defense-related industry during the ten year period coincided with the steady decline of the formerly preeminant "food, textiles, and apparel" category.

[1] *Defense Spending and Massachusetts Employment, 1969-1979*, Massachusetts Division of Employment Security, Charles F. Hurley Building, Government Center, Boston, January 1981

Table 1

Military Prime Contract Awards $10,000 or Greater
11 Highest Ranking States
by Rank and Percent of Contracts Award Value
1970-1979

	Ten Year Total		1970		1971		1973		1973		1974		1975		1976		1977		1978		1979	
State	Rank	Per-cent	Rank	Per-cent	Rank	Per-cent	Rank	Per-cent	Rank	Per-cent	Rank	Per-cent	Rank	Per-cent	Rank	Per-cent	Rank	Per-cent	Rank	Per-cent	Rank	Per cent
California	1	18.6	1	17.3	1	16.3	1	16.6	1	17.9	1	18.3	1	18.0	1	20.0	1	19.1	1	19.6	1	20.6
Connecticut	4	4.9	4	3.7	6	3.7	7	3.5	8	2.9	3	7.0	3	5.4	6	4.3	7	3.7	4	6.5	4	6.6
Florida	10	2.5	9	2.5	9	2.5	6	3.7	10	2.3	10	2.1	9	2.4	10	2.2	10	2.0	10	2.6	9	3.1
Indiana	11	2.0	8	2.7	10	2.4	11	2.3	11	1.8	11	2.0	11	1.9	11	1.8	11	1.6	11	1.7	11	2.0
MASSACHUSETTS	5	4.5	5	3.6	5	4.0	5	4.0	4	4.6	5	4.7	5	4.1	5	4.4	5	4.5	6	5.2	6	5.3
Missouri	6	4.3	7	2.9	8	2.7	4	4.8	6	3.4	6	3.6	7	3.3	3	5.1	4	4.5	5	5.6	5	5.8
New York	2	8.7	2	9.2	2	10.4	2	9.7	2	10.0	2	7.4	2	8.6	2	7.4	2	8.2	3	8.6	2	8.7
Pennsylvania	8	3.1	6	3.5	7	3.1	8	3.1	5	3.6	7	3.5	10	2.5	9	2.8	9	3.1	9	3.0	8	3.3
Texas	3	6.6	3	8.3	3	8.4	3	6.9	3	6.4	4	5.1	4	4.7	4	4.7	3	5.3	2	9.2	3	7.5
Virginia	7	3.3	10	1.9	4	4.0	9	2.8	9	2.3	8	2.5	8	2.8	7	3.6	6	3.9	8	3.2	7	4.8
Washington	9	2.8	11	1.7	11	2.2	10	2.7	7	3.0	9	2.2	6	3.8	8	2.9	8	3.3	7	3.4	10	2.7

Source: Department of Defense and Statistical Abstract of the United States

Table 2

Massachusetts Defense Related Employment
for Selected Industries
1969 - 1978

Defense Related Industries	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Ordnance	24,461	21,745	17,420	15,282	14,581	16,337	NA	NA	NA	NA
Food, Textiles & Apparel	126,527	119,591	110,381	110,050	112,891	107,487	91,881	99,985	98,803	99,245
Lumber, Furniture, Paper and Publishing	94,823	64,629	88,744	83,576	91,127	89,606	81,410	82,200	83,706	85,933
Chemicals, Petroleum, Rubber and Plastics	56,548	38,578	51,048	51,507	54,611	55,392	46,118	48,597	48,072	51,091
Leather, Metals & Fabricated Metals	41,562	111,139	87,015	87,517	89,081	90,266	84,854	87,771	86,362	92,785
Machinery, Electric and Nonelectric	105,998	178,012	148,482	147,135	163,257	180,573	163,768	159,781	171,940	184,134
Transportation Equipment	28,327	27,772	24,085	21,956	19,841	16,545	29,955	28,394	33,538	53,205
Instruments and Clocks	31,004	32,961	30,752	30,529	34,997	39,776	44,316	43,652	48,965	54,747
Total Defense Related Industries	509,250	594,427	557,927	547,552	580,386	596,979	542,302	550,380	571,386	621,440

Source: Massachusetts Division of Employment Security ES-202 Insured Employed.
Note: Survey Month March of each year

A look at the regional distribution of prime contracts in the Commonwealth reveals the Boston Standard Metropolitan Statistical Area (SMSA) to be decisively the leader. In 1978 and 1979 it received over 78% of the state's MPC awards. The Lawrence-Haverhill SMSA had the second largest totals, 10.6% in 1978 and 9.6% in 1979. These SMSAs contributed significantly to total MPCs in the Commonwealth's northeast region, which accounted for 90% of MPCs awarded to the state.

The January 1982 Massachusetts Economic Policy Analysis (MEPA) Model Forecast

by George Treyz and Roy Williams*

The recession is now well under way with national unemployment near nine percent and likely to stay in that range at least through the middle of next year after which it is forecast to decline only very slowly. The Massachusetts unemployment rate has also increased, but it remains below the national rate in the most recent quarter (7.5 for Massachusetts vs. 8.4 for the U.S.). We predict that it will remain that way over the forecast horizon.

Our forecast thus remains fairly optimistic for Massachusetts relative to the nation. In light of the strong dollar and its likely negative effect on high technology exports, this "relative optimism" requires some explanation. First, our competitive position relative to the rest of the nation is not deteriorating despite our stronger economy. This is apparent in our measure of relative Massachusetts business costs which is 4.5 percent lower than it was in 1973 and 1.6 percent below what it was in 1977. This is a very good omen for our likely future growth. Second, much of our industry is fairly concentrated in the growing high technology and service sectors. This underlying growth should help to support the economy during the recession. Third, increases in defense procurement should help the Massachusetts economy as 1982 progresses. These factors underlie our forecast in which the annual unemployment rate remains substantially lower in Massachusetts than in the nation. However, the measured unemployment rate is subject to sampling error and thus the highly volatile spread between the measured Massachusetts and U.S. unemployment rates can be expected to fluctuate on a month-to-month basis.

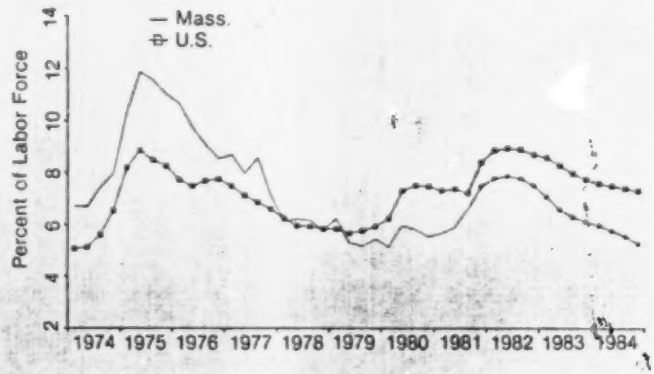
The good news about 1982 is that inflation is forecast to decelerate. Consumer prices are forecast to grow slightly less than seven percent in 1982. In later years, they are predicted to grow at about 8 percent. This modest price growth combined with personal tax cuts leads to some growth in real disposable per capita incomes in each of the forecast years. The lower inflation will, however, have some adverse effects on Massachusetts sales tax collections.

One of the surprising phenomena of recent years has been an apparent continued decline in the Massachusetts population even though the United States population has been growing. This decline in Massachusetts' share has continued in recent years but we predict that the rate of decline will be reduced as the relatively favorable economic climate in Massachusetts encourages people to stay in the state.

In contrast, the 16-year-and-over population has been growing in Massachusetts in recent years. However, demographic shifts lead us to predict that our sixteen-and-over population will grow a little more slowly in the forecast period in spite of the improvement in total population share. This growth in the adult population will tend to increase our labor force at about two percent per year over the next three years. This will mean that the unemployment rate will grow unless employment grows at least that fast.

In summary, we expect soft economic conditions both in the nation and in Massachusetts through the first part or middle of 1982. We also expect that, despite uncertainities in export markets, Massachusetts will remain somewhat better off in terms of unemployment than the rest of the nation.

Unemployment Rate



Real Per Capita Disposable Income
Mass. Relative to U.S.

*Director and Associate Director, respectively, of the MEPA project, Economics Department, University of Massachusetts, Amherst, MA 01003. (Tel. 413-545-0915). Technical support was given by staff of the Massachusetts Division of Employment Security. Support from the Legislative Science Resource Office, the Department of Public Welfare, the Division of Employment Security, and Massport. National inputs from CONTROL122181 from Data Resources, Inc.

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January Control Forecast

Summary Report
Massachusetts Economic Policy Analysis Model
(Seasonally Adjusted Annual Rates)

	1981	1982	1983	1981:3	1981:4	1982:1	1982:2	1982:3
Employment—Nonag. W. & S.	2660	2665	2742	2629	2650	2655	2659	2665
% Change	.4	.2	2.9	-6.9	3.3	.8	.6	.9
Manufacturing	668	667	702	664	668	664	663	667
% Change	-.7	-.2	5.2	-5.5	2.3	-2.3	-.1	1.9
Non-Manufacturing	1991	1997	2040	1965	1982	1992	1996	1999
% Change	.8	.3	2.1	-7.3	3.6	1.9	.8	.6
Unemployment Rate	6.4	7.8	6.5	6.6	7.5	7.8	7.9	7.8
Employment Rate Index*	105.0	104.6	106.9	103.7	104.3	104.4	104.5	104.5
% Change	-.5	-.4	2.3	-7.7	2.3	.4	.2	.3
Relative to U.S. Index*	99.9	100.3	101.1	98.4	99.6	100.1	100.3	100.3
Rate of Wage Change	9.0	7.6	7.6	7.4	7.3	6.5	7.4	9.3
Wage Index Rel. to U.S.*	93.8	93.8	93.6	93.8	93.8	93.9	93.9	93.9
Avg. Weekly Hours in Mfg.	40.2	40.2	40.5	40.0	40.1	40.1	40.1	40.2
Rate of Price Inflation	11.2	6.7	8.0	8.9	7.1	4.3	6.5	7.5
Relative to U.S. CPI*	96.7	95.6	95.7	96.5	96.1	95.6	95.6	95.6
Personal Income (mil$)	63088	68355	75867	63399	64770	65873	67215	69248
% Change	10.2	8.3	11.0	4.0	8.9	7.0	8.4	12.7
Disposable Income (mil$)	52554	57343	64256	52647	54115	55006	56046	58450
% Change	9.7	9.1	12.1	3.1	11.6	6.8	7.8	18.3
Real Per Cap. D.I. Index*	105.0	107.2	110.5	104.2	105.2	105.7	105.9	108.4
Relative to U.S.*	104.1	105.3	105.4	103.4	104.3	105.2	105.4	105.4
Rel. Business Cost Index*	96.5	96.4	96.3	96.7	96.5	96.4	96.4	96.5
Manufacturing*	95.2	94.8	94.7	95.0	94.9	94.8	94.8	94.9
Non-Manufacturing*	97.1	97.1	97.0	97.4	97.2	97.1	97.1	97.2

*Indexes equal 100 in calendar 1973.

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The views expressed by contributing authors are not necessarily those of the Report, the School of Business Administration, or the University. The editor welcomes comments about this issue and suggestions for future inclusion.

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MASSACHUSETTS BUSINESS AND ECONOMIC REPORT

Management Research Center, School of Business Administration
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Spring 1982

High Technology and Education: A Vital Partnership

Howard Foley
President
Massachusetts High Technology Council

The "Help Wanted" pages of Massachusetts Sunday papers are still filled with high tech ads looking for engineers and computer scientists. However, today's ads no longer indicate phenomenal company growth. Instead, the ads represent a dwindling technical talent supply that has finally been outstripped by high tech industry demand, and unless the industry, state government, and education work to alleviate this concern, our state, and all those who live and work in the Commonwealth, could be in trouble.

Massachusetts educators noted at our February 10th Engineering Education Conference that the U.S. undergraduate engineering population has increased by almost 50% since 1975 (Figure 1). They added that this is still not enough to meet the future demand of industry, and that the system itself is now at saturation. Future expansion, they said, is limited by a number of factors, and added that some relate to money and some relate to traditional views of education.

Their main concerns include the following:

- Secondary school preparation — In 17,600 U.S. school districts, only one in three offers more than one year of mathematics or science in high school education. Furthermore, only one high school graduate in six in 1981 has studied mathematics or science for more than one year.
- College preparation — The United States produces about half as many engineers as Japan, per capita, and only about 5.8% of our bachelors degrees are in engineering. In Japan, about 21% of their bachelors degrees are in engineering, and in West Germany, about 37% of their bachelors degrees are in engineering. The Soviet Union and the eastern block countries are doing even better.
- Graduate school enrollment decline — In recent years, entry level engineering salaries for bachelors graduates have risen dramatically, causing a gradual decline in the percentage of bachelors degree graduates in engineering who go on to graduate school, and an increase in the number who go on to industry. For example, in 1970, there were approximately 3500 doctoral degrees awarded in engineering in the United States, while only about 2500 were awarded in the last year for which we have accurate, complete data. Yet we know the number of undergraduates in engineering has increased markedly in the last ten years. In 1970, approximately 900 of these degree candidates were foreign students, while today, almost half are awarded to foreign students. In that last year, only about 1250 doctoral degrees were awarded to U.S. citizens.
- Faculty shortages and faculty salaries — Today, about ten to twelve percent of this nation's 25,000 faculty positions in engineering are vacant, and since 1971, salaries in industry have increased by 129% while salaries at most colleges and universities have failed to increase by more than 80%.
- Faculty quality of life — As enrollments have increased, faculty sizes have stayed the same, the financial gap between industry and academia has grown, teaching loads have become very heavy, and the opportunity to do forefront research in academia has shrunk considerably. Further, half of the instrumentation in the industrial setting, on the average, was purchased less than three and one-half years ago, while half of the instrumentation in academia was purchased about seven years ago — at a time when instrumentation is changing rapidly and the capacity of instrumentation expands daily with the incorporation of microelectronics, microprocessors, and other modern technology.

Finally, total federal support for university R & D plant development (buildings, equipment, etc. to be used for R & D) has virtually ceased to exist over the course of the last 15 or 20 years. The reduction in nominal dollars is about 80% — If the figures were adjusted for inflation, the percentage would double or triple (Figure 2).

As industry continues to expand and the technical talent pool continues to stay the same size, recruiting expeditions by out-of-state firms seeking to hire our technical talent away will continue to intensify.

To counter this, state government, academia, and industry must do more than just talk about the need to cooperate, collaborate, or commiserate. They must play a real pro-active role to ensure the continued growth and expansion of the high tech industry. It has become and will continue to be the indispensable economic core of

1

this region's industrial and economic development.

This means working to expand the capacity of our technical and educational programs, and improving the quality of the programs we already have. We've made a lot of progress in the last 3 years, but much more remains to be made.

For example, we find today that Texas annually graduates more electronics engineers and computer science majors than we do. In 1958, Texas graduated 492 and Massachusetts graduated 781. In 1981, Texas graduated about 4 000 and Massachusetts graduated about 3,000. That's against a projected demand, just from our member companies, of about 3,000 a year over the next several years. Worse still, about 25% of the Massachusetts graduates will leave the state after graduation.

The High Tech Council has implemented a number of programs designed to help expand capacity and improve quality in the short term. We have established electronic technician training programs for technical paraprofessionals, stepped up recruiting efforts at out-of-state engineering schools, and worked with the state and community college system to initiate tech writing and computer programming courses for former school teachers who have been laid off due to declining enrollments.

To help over the long term, we recently developed and formally endorsed a "white paper" on industry/university relations, geared specifically toward expanding engineering and computer science education opportunities over time and improving existing curricula. We then brought our member company executives together with the presidents and deans of the region's major engineering schools in early February to discuss ways in which high tech companies could help universities enhance engineering and computer science education opportunities.

Not surprisingly, our decision to increase member company support for higher education in 1982 to 2% of each company's R & D expenditures has attracted the most attention. In fact, many news stories and editorials have adopted it as "The 2% Solution," and translated it into a minimum investment of $15 million in Massachusetts — just from our member companies.

We are not, however, serving as a central money fund or foundation. Instead, we act as a facilitator and clearinghouse — bringing individual companies together with colleges and universities, and letting the companies that are donating the time and money hash out implementation techniques directly with the educators.

Many of our members are already involved in university relations programs with local schools, and in order to strengthen the linkage and recognize its importance, one company — Analog Devices of Norwood — has taken university programs out of its corporate contributions committee, and established a separate university relations committee headed by its vice president for strategic planning.

Effective programs in which our members currently participate include the following:

- Career development faculty chairs — whereby companies finance salary and equipment costs for a new or expanding high technology program at a college or university over an extended period of time, improving the quality of life for the professor, and the quality of technical education for the students.
- Adjunct professorships — whereby companies "loan" employees to colleges and universities to teach courses in their fields or expertise once or twice a week. Data General, for example, has two employees teaching at Lowell University on a part-time basis.
- Curriculum and faculty development and assistance — whereby companies help schools expand or improve technical curricula by providing technical assistance and company training programs. Lowell University, for example, has three professors enrolled in training courses at Data General, while the High Tech Council has published a number of curriculum guides concerning all kinds of technical education.
- Learn-while-you-earn and continuing education — whereby companies have offered part-time consulting contracts to engineering and computer science masters and Ph.D. candidates, encouraging them to go on with their education by alleviating some of the financial pain that accompanies this decision, and have developed retraining programs with colleges and universities that are used to bring older employees up to speed with new technology.

I might add that current federal tax policies concerning R & D tax credits and equipment donation deductions have made corporate investment in higher education virtually painless, and I would not be surprised to see many companies follow the lead of Wang Laboratories of Lowell, which recently made its first contribution to higher education: a $3 million equipment donation to the state university system.

In the end, high tech, government, and academia must work together to bring old attitudes up to date and to finance new methods and techniques. A good first step would be to encourage initiatives which will improve the computational skills of graduates. Along with this would come a greater familiarity and literacy with analytical tools like the computer, making it possible for graduates to function more successfully in our evolving society.

But educational institutions cannot do this alone. They need help: strategic, financial, and logistic. Industry must be a partner by providing assistance and recognizing that an intelligent investment in education is an enlightened investment in its own future expansion, growth, and ultimate success.

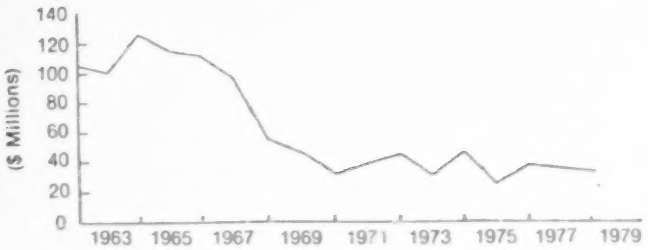
In the long run, this investment will help everyone in Massachusetts, for to be technologically rich is even more valuable than to be oil rich, because technological creativity is inexhaustible, if we seize the opportunity that is before us.

Figure 1 U.S. Engineering Bachelor's Degrees

Source: Engineering Manpower Commission

Figure 2 **Federal Funding for University R & D Plant**

Source: National Science Foundation



The Economic Impacts of Jobs Created by Industrial Revenue Bonds in Massachusetts

Samuel Seskin
Associate Director
Center for Economic Development
School of Business Administration
UMASS/Amherst

The Industrial Revenue Bond (IRB) Program has contributed measurably to the economy of Massachusetts. All indices of economic impacts in Massachusetts, including employment, unemployment, income and state revenues, have been positively affected by the Industrial Revenue Bond program. These conclusions result from an analysis of actual job creation figures from 1978 through 1981, using information contained in a survey of IRB recipients taken by the Massachusetts Industrial Finance Agency (MIFA) in October of 1981. The Center for Economic Development estimated the impacts of the jobs directly created by Industrial Revenue Bonds in cooperation with the Massachusetts Economic Policy Analysis Model (MEPA) of the University of Massachusetts.

Table 1 **Summary of Economic Impacts**

	Jobs Created (Direct & Indirect)	Unemployment Reduced	Net Gain In Personal Income	Net Gain In State Tax Revenues
Short-Term (5 Years)	25,053	0.36%	0.70%	1.02%
Long-Term (14 Years)	16,696	0.22%	0.59%	0.84%

Although the tightness of the Massachusetts labor market, especially in its high-growth industries, will somewhat reduce the magnitude of IRB economic benefits during the next ten years, the long-run benefits of the Industrial Revenue Bond program are clear. We estimate that almost 17,000 new jobs will be added permanently in Massachusetts as a result of financing through the IRB program between 1978 and 1981. Table 1 contains the highlights of the economic impact analysis.

To determine the economic effects of the jobs created through the use of Industrial Revenue Bonds in Massachusetts between 1978 and 1981, this study employed the following procedure:

1. *Characterize the firms that have received revenues from the sale of Industrial Revenue Bonds.*
The Massachusetts Industrial Finance Agency (MIFA) has compiled a list of all such companies.[1] The list formed the basis for the Center for Economic Development's work.

The Center selected a 50% sample of the 870 firms that have received IRBs since the inception of the program. The staff classified the 435 firms selected in terms of their Standard Industrial Classification (SIC), effectively sorting them according to the product or service that they provide.[2]

2. *Determine the number of jobs directly created resulting from Industrial Revenue Bonds.*
The staff tallied the number of jobs created by the 435 firms in the sample. It allocated them to one of 29 SIC categories used in the MEPA Model. These categories represent the major types of industrial, commercial and service activities in the Massachusetts economy.

After determining the proportion of all the jobs in the sample group represented by each of the 29 subgroups, the staff applied these proportions to the total number of jobs reported by all 870 IRB beneficiaries.[3] In this way, the staff determined the distribution of all the jobs reportedly created by IRB between 1978 and 1981.[4]

Have all 47,053 jobs reported to MIFA at the time the 870 firms applied for IRB financing actually been created? MIFA conducted a survey in October 1981 to determine the "usefulness of these bonds as an incentive to stimulate investment and economic growth and to generate new employment."[5] The survey provided information which allowed the staff to answer this question responsibly and efficiently.

Analysis of the results of the survey indicates that it is appropriate to adjust the job creation figures reported to MIFA. The factor used for this adjustment was 0.5. In other words, the Center for Economic Development determined, from information in the MIFA survey cited above, that approximately 50% of the jobs reportedly "created" by the sale of Industrial Revenue Bonds would actually have been created without use of the bonds for the following reasons:

a. Companies responsible for creating 6% of the surveyed jobs reported that there would have been no change in their plans had IRBs not been available.
b. Companies responsible for 17% of the surveyed jobs reported that the absence of IRBs would have delayed, but not cancelled, their expansion plans.
c. Companies responsible for 28% of the surveyed jobs reported that they would have expanded less without the benfit of IRBs, but that they planned to create 58% of these jobs anyway.

1. The list is published in MIFA's 1981 Annual Report.
2. The SIC categories are those used in the Massachusetts Economic Policy Analysis model.
3. The figure used was 47,053 jobs, the sum of all jobs reported to have been created by the firms themselves.
4. Firms whose product could not be identified were classified as either commercial, industrial, or warehouse/distribution. The jobs that they created were distributed through the relevant two digit SIC codes.
5. "Economic Growth and Industrial Revenue Bonds in Massachusetts." Massachusetts Industrial Finance Agency, October, 1981, p. 3.

d. Companies responsible for creating one out of every five of the surveyed jobs reported that they would have either expanded less or out-of-state. The staff applied the same ratio used in (c), above, to these jobs and inferred that 58% of the jobs would have been created without the benefit of IRB financing.

The sum of the proportional adjustments required by the evidence in (a) through (d), above, is 50%. This is the proportion of jobs which, *based on the results of the above referenced survey*, would have been created by firms receiving IRB proceeds regardless of whether such proceeds were in fact available.

In addition to the 50% adjustment, it is necessary to make one further adjustment to the job creation figures reported to MIFA. Every company receiving IRB financing sells its products or services within some market area. The market area for each firm and for each industrial classification within Massachusetts is slightly different. Some proportion of the goods or services of each type of business is sold within Massachusetts and some proportion is exported to other states (or nations). For some industries (office, computing and accounting machines (SIC 357), to cite an example) over 90% of output is sold outside of Massachusetts. On the other hand, over 90% of the sales of Massachusetts retail establishments are made within the boundaries of the state.

The extent to which a company's product or service is exported affects the extent to which new jobs are actually created for and within Massachusetts. Companies selling their products in a national market, but making them in Massachusetts, are "creating" jobs in the state; companies selling all their goods within Massachusetts, even if they build new plants and hire employees, are not adding jobs in the state. They are simply competing for a share of an existing market.

Thus, the staff adjusted the figures for new jobs by a series of factors representing the degree to which the product of each type of business is consumed outside the state. These factors are called "export ratios." They are listed in column 4 of the same table. The weighted average of these export ratios, shown at the bottom of the column, is 0.613. In other words, 61% of the products of companies receiving IRBs are bought or consumed by customers outside of Massachusetts. The staff therefore assumed that 61% of the jobs listed in column 3 were actually "created" with MIFA's aid. The other 39% were "borrowed" at the expense of other in-state companies that make the same product.

Finally, the staff calculated the number of jobs actually "created" by IRBs, taking into consideration both the extent to which the expansions would have taken place without an industrial revenue bond program and the extent to which the companies' products are exported. The staff concluded that the number of new jobs directly created by recipients of IRBs between 1978 and 1981 was 14,441. Of this number, 97% (13,960) are in the manufacturing sector and 3% (458) are in the various service sectors.

3. *Determine the indirect economic effects of the new jobs actually created.*

To determine the indirect effects of the creation of the jobs cited above, the Center used the Massachusetts Economic Policy Analysis Model (MEPA). The model predicts the value of a variety of indicators of the state's economy, including the following:

— indirect job creation (i.e., employment)
— unemployment
— wages
— income
— tax revenues
— relative business costs

The model is not retroactive, it is predictive. In order to simulate the effects of the 14,441 jobs, it looks ahead for a number of years from the date that the model is run and estimates the value of the types of variables cited above. Thus, to determine the economic effects of the jobs at issue, the staff assumed that 14,441 jobs were created over a period of five years (20 calendar quarters), representing a realistic amount of time to spend the bond proceeds and hire needed employees. The time during which these jobs were added to the Massachusetts economy is not 1978 to 1983, but 1982 through 1986. The model furnished data for each year, from 1982 until 1995, the year in which the added jobs have been assimilated into the economy and the indirect effects have stabilized.

Jobs

Results of this inquiry indicate that the 14,441 jobs created by companies receiving IRB funds will generate several thousand additional jobs as a result of demands for goods and services in the state's economy. Specifically, the 14,441 new jobs will generate a total of 25,053 manufacturing and service jobs, directly and indirectly, during the first five years of job creation (20 calendar quarters). This five year period, in terms of the model, ends in 1986.

After the fifth year, forces in the Massachusetts economy appear to whittle down the net impact of the new jobs. These forces include the tightness of the labor market in several key sectors of the state's economy, including the fast growing electrical and nonelectrical machinery sectors, the need to increase wages in these sectors to attract new employees, and the higher costs of production resulting from increased labor costs. The effect of these factors is that some short-term gains in employment fade away in subsequent years. By the 14th year, 16,696 jobs remain of the 25,053.

Nevertheless, the long-term impacts of the "IRB" jobs are quite positive. By the final year (1995) of the model's projections, the 14,441 jobs directly added from 1982 to 1986 have created an additional 2,255 jobs indirectly, making a long-term job total of 16,696.

In the *service sector* only, the 458 jobs directly created by IRB recipients in years 1 - 5 increase to a total of 4,680 by year fourteen. Of the 13,960 *manufacturing* jobs created during the same early years of the forecast, 11,952 remain in year fourteen despite the tightness of the Massachusetts labor market and the highly competitive high-growth sectors in which most IRB recipients are doing business.

Unemployment

Jobs resulting from IRB financing will be responsible for a reduction of 0.36% in the state's unemployment rate at the completion of the hiring phase (year 5). By year fourteen, despite some declines in the overall job creation figures, unemployment remains 0.22% lower than it would be without the newly created jobs.

Income

There are many measures of income, and many indicators of the positive effects of the new jobs on income

levels in Massachusetts. One of the simplest and thus most useful is the gain in total personal income resulting from the jobs both directly and indirectly created in any given year.

In 1986, at the conclusion of the job creation phase of the forecast, total personal income in Massachusetts is forecast to be $788 million higher than it would be without the IRB jobs. This represents a gain of 0.70% in total personal income for that year. Disposable income is forecast to be $654 million higher, a net gain of 0.75%. In 1995, the final year of the forecast, the net gain in personal income in the state as a result of the IRB jobs is forecast to be 0.59% higher than it would be without these new jobs. Similarly, disposable income is forecast to be 0.58% higher. In both cases, the dollar amounts have not been adjusted for inflation. Thus, the percentage figures represent the more useful index of personal income gain.

State and Federal Tax Revenues

The jobs created directly and indirectly by IRB recipients will generate revenues of all types for Massachusetts. Wages paid to the new employees will generate income tax revenues; expenditures made by these employees will generate sales tax receipts. The entire spectrum of revenue sources in the Commonwealth will be enhanced to some degree. Revenues from income taxes on wages of new employees, employed directly or indirectly as a result of IRB financing, will be 1.33% greater in year five than they would be otherwise. In year fourteen, income tax receipts are estimated to be 0.93% higher than they would be without the IRB jobs. Sales tax revenues are estimated to be 1.05% higher in year five and 0.73% higher in year fourteen than they would be without the benefits of the IRB jobs.

Overall, tax revenues in Massachusetts will be $67.9 million higher in 1986 and $122.3 million higher in 1995 than they would be without the jobs financed by IRBs. These figures are not adjusted for inflation; thus, it is more useful to use percentages. The additional revenues to the state, in percentage terms, will be 1.02% in year five and 0.84% in year fourteen.

SBA Management Development Programs — Autumn 1982

This fall, the School of Business Administration will offer a rich variety of courses and seminars for management professionals. For further information about the tentative schedule appearing below, contact James D. Malone at the School of Business Administration (tel. 413-549-4930).

Federal Taxes and Bankruptcy	September
Quality Circles	October
Conflict Management	October
Effective Management Skills	November
Improved Sales Management Performance	November
Improved Sales Forecasting Techniques	December

SBA will offer noncomputer professionals the following two courses in computer applications:

Business Applications of Computer Systems	September— December
Computer Information Systems	September—November

The April 1982 Massachusetts Economic Policy Analysis (MEPA) Model Forecast

by George Treyz and Roy Williams*

Employment in Massachusetts in 1982 is projected to average about the same as it did in 1981. Revised figures released too late to be incorporated in this forecast will show that there was no employment growth in Massachusetts in 1981 either. The expanding labor force together with level employment performance explains the Massachusetts unemployment rate increase of two percentage points from 1980 through 1982. In line with the U.S. forecast, employment is projected to decrease moderately through the third quarter of 1982 before expanding at a sluggish rate in 1983 and 1984. Thus, the unemployment rate can be expected to increase still further in 1982 before stabilizing and beginning to turn down in 1983 and 1984.

Despite this unsatisfactory unemployment performance in Massachusetts, our rate has stayed below the national rate by about one or two percentage points. We predict that it will remain below the national rate, but that the average difference will diminish slightly. Substantial monthly deviations in that spread can be expected, because the reported unemployment rate in Massachusetts is based on a very small sample.

Why has our unemployment rate remained lower than the U.S. rate and why is it forecast to remain lower? There are several reasons: first, we have a less than proportional representation in the hard-hit construction and automobile industries. Even as the recovery progresses the construction industry may remain a major victim of continued high real interest rates. Second, the underlying growth in our high technology industries has benefitted us to date and will probably remain a positive if somewhat diminished factor. Third, our relative production costs have improved over the last decade. This will continue to be an underlying positive factor. Finally, the Massachusetts population continues to grow less rapidly than that in the rest of the United States. This means that our labor force will grow less rapidly and that the growth in employment required to avoid higher unemployment rates is less than it is in states with a faster growing population.

The news on the inflation front is very good with the Massachusetts rate this year projected to be in the 6 percent range compared with a rate of over 12 percent in 1980. This drop in the inflation rate combined with the federal income tax cuts leads to an increase in the Massachusetts real per capita disposable index to a level of 110 in 1982 and 113 in 1983 compared with a value of less than 106 in 1981. This projected gain from 1981 through 1983 is as great as the entire gain from

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1973 through 1981. It is paradoxical that the gain from 1981 to 1983 comes at the same time that the unemployment rate is projected to increase from 6.3 to 7.3 percent.

Massachusetts tax revenues continue to come somewhat faster than other economic statistics would lead us to expect. Despite the relatively good collections at present, we are still projecting revenues for fiscal 1983 at levels lower than those contained in the currently proposed state budget.

April Control Forecast

Summary Report
Massachusetts Economic Policy Analysis Model
(Units as Indicated)

	1981	1982	1983	1982:1	1982:2	1982:3	1982:4	1983:1
Employment — Nonag. W. & S.	2664	2656	2695	2674	2657	2644	2649	2664
% Change	.6	-.3	1.5	.8	-2.6	-1.9	.8	2.3
Manufacturing	668	643	652	657	643	635	636	642
% Change	-.7	-3.8	1.4	6.0	-8.4	-4.7	.4	3.7
Non-Manufacturing	1996	2013	2043	2017	2014	2009	2013	2022
% Change	1.1	.9	1.5	3.2	-.6	-1.0	.9	1.8
Unemployment Rate	6.3	7.8	7.4	7.3	7.8	8.1	8.1	7.9
Employment Rate Index*	105.6	104.2	105.2	105.1	104.3	103.7	103.7	104.2
% Change	.6	-1.3	.9	-.7	-3.1	-2.4	.3	1.7
Relative to U.S. Index*	100.5	101.4	101.7	101.5	101.5	101.3	101.3	101.4
Rate of Wage Change	8.9	8.0	7.1	8.4	7.7	8.5	8.1	5.3
Wage Index Rel. to U.S.*	93.7	94.0	94.2	93.9	94.0	94.0	94.0	94.0
Avg. Weekly Hours in Mfg.	40.1	39.9	40.3	40.0	39.9	39.9	40.0	40.1
Rate of Price Inflation	11.1	5.8	7.1	4.1	4.8	5.9	7.3	7.5
Relative to U.S. CPI*	96.7	96.2	96.4	96.1	96.2	96.2	96.3	96.3
Personal Income (mil$)	63563	69470	76240	67498	68539	70047	71795	73405
% Change	11.0	9.3	9.7	9.9	6.3	9.1	10.4	9.3
Disposable Income (mil$)	52922	58439	64647	56495	57304	59307	60649	62032
% Change	10.5	10.4	10.6	11.3	5.9	14.7	9.4	9.4
Real Per Cap. D.I. Index*	105.8	110.1	113.3	108.9	109.0	111.1	111.5	112.9
Relative to U.S.*	104.8	107.8	107.7	108.0	107.8	107.7	107.6	107.6
Rel. Business Cost Index*	96.5	96.9	97.1	96.8	96.9	96.9	96.9	96.9
Manufacturing*	95.1	95.0	95.1	94.9	95.0	95.0	95.0	95.0
Non-Manufacturing*	97.2	97.8	98.0	97.7	97.7	97.8	97.8	97.8

*Indexes equal 100 in calendar 1973.

Massachusetts Business and Economic Report

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